e/pi studies

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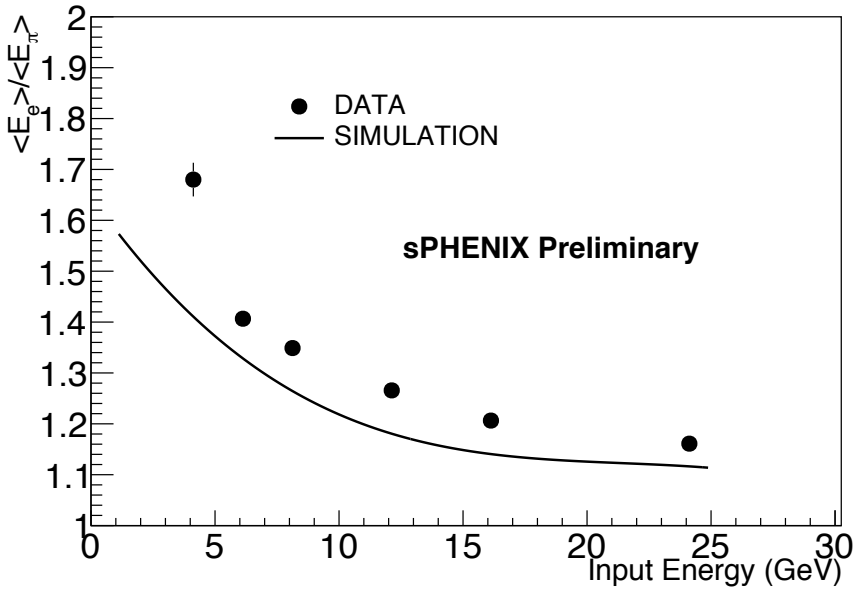
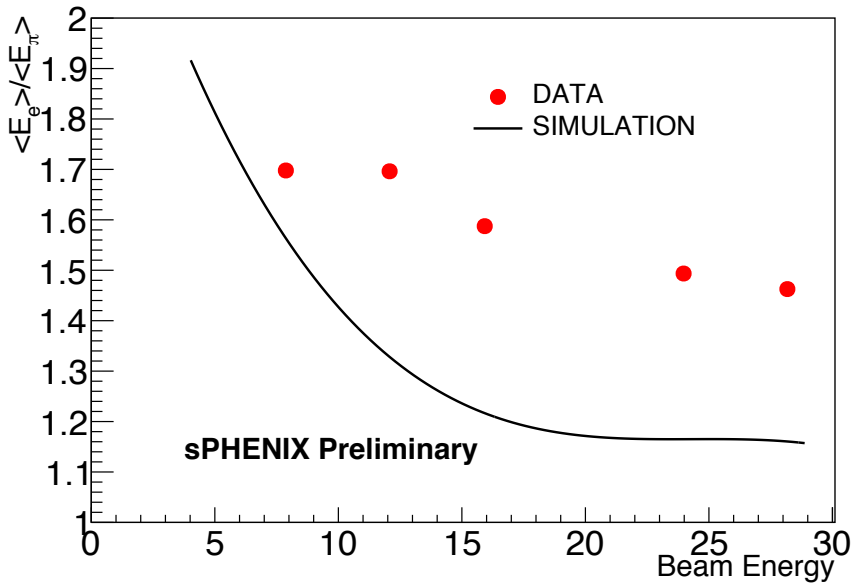
e/pi preliminary plots

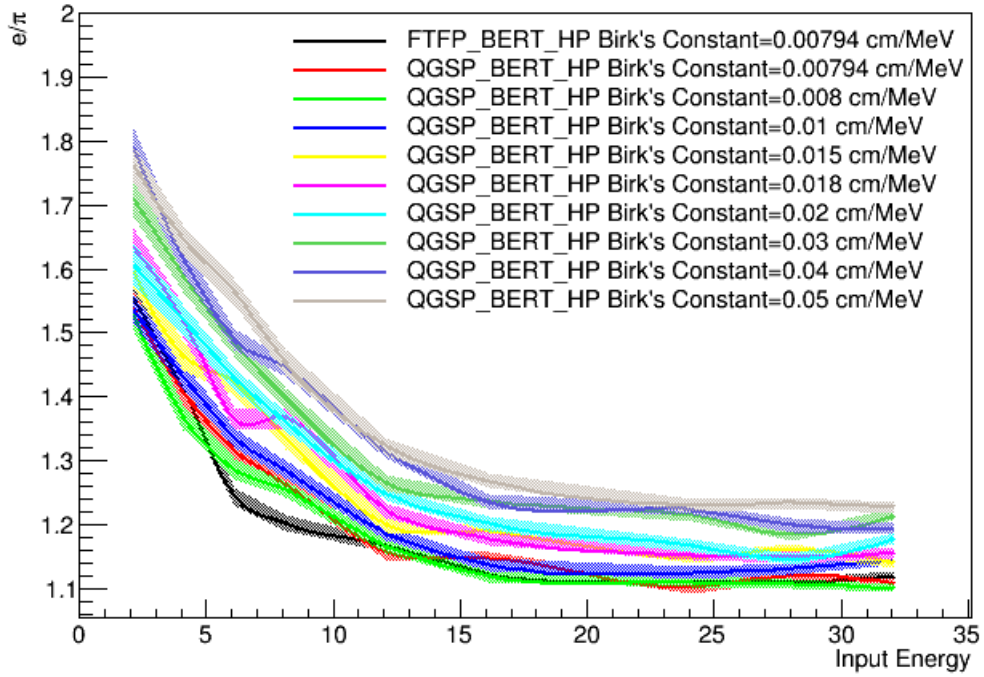




We observed significant deviation between data and default Geant4.
Out default simulation setup:
Physics list: QGSP_BERT_HP
Birk's constant: 0.0794*mm/MeV

Suggestion: Change Birk's constant and Physics lists.

HCAL ONLY simulations



Run lot of simulation since last week.

Default Birk's constant implemented deep inside Geant4::G4EmSaturation.

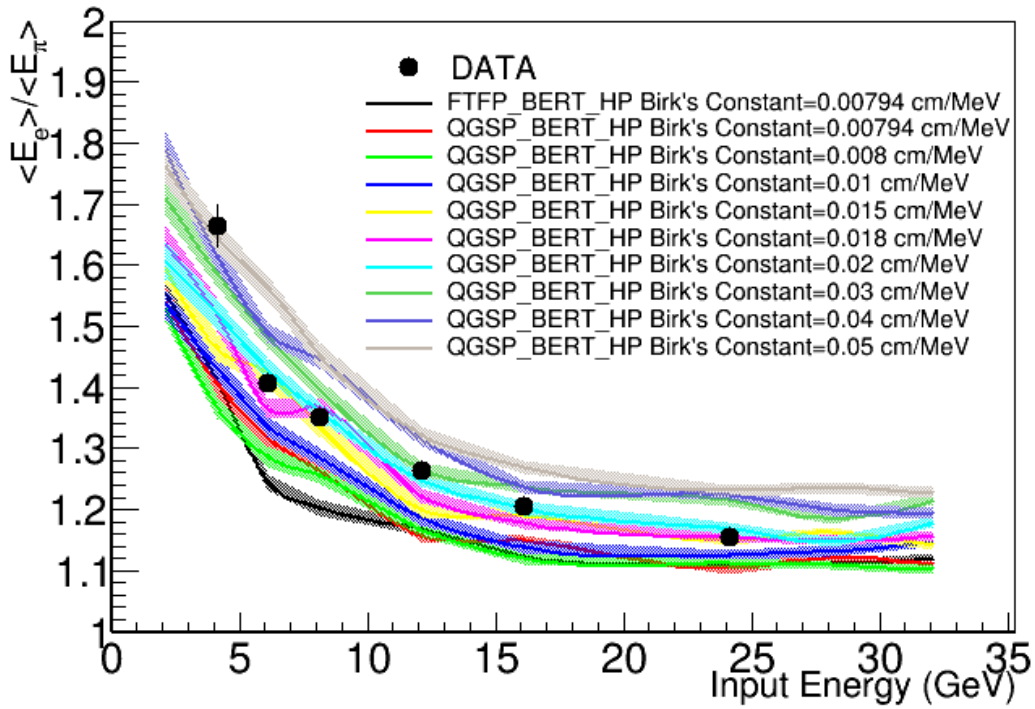
In future I think we should change Birk's constant from macro itself.

Inside PHG4Reco:

```
G4Material *Epoxy =
nist>FindOrBuildMaterial("G4_POLYSTYRENE");
 //Change Birk constant
Epoxy->GetIonisation()->SetBirksConstant( new_value*cm/
MeV);
```

Confirm the value implemented in stepping action.

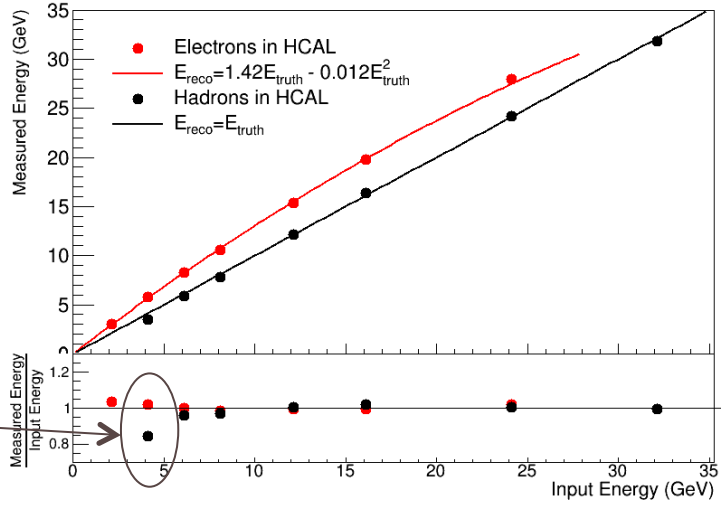
Comparison with data



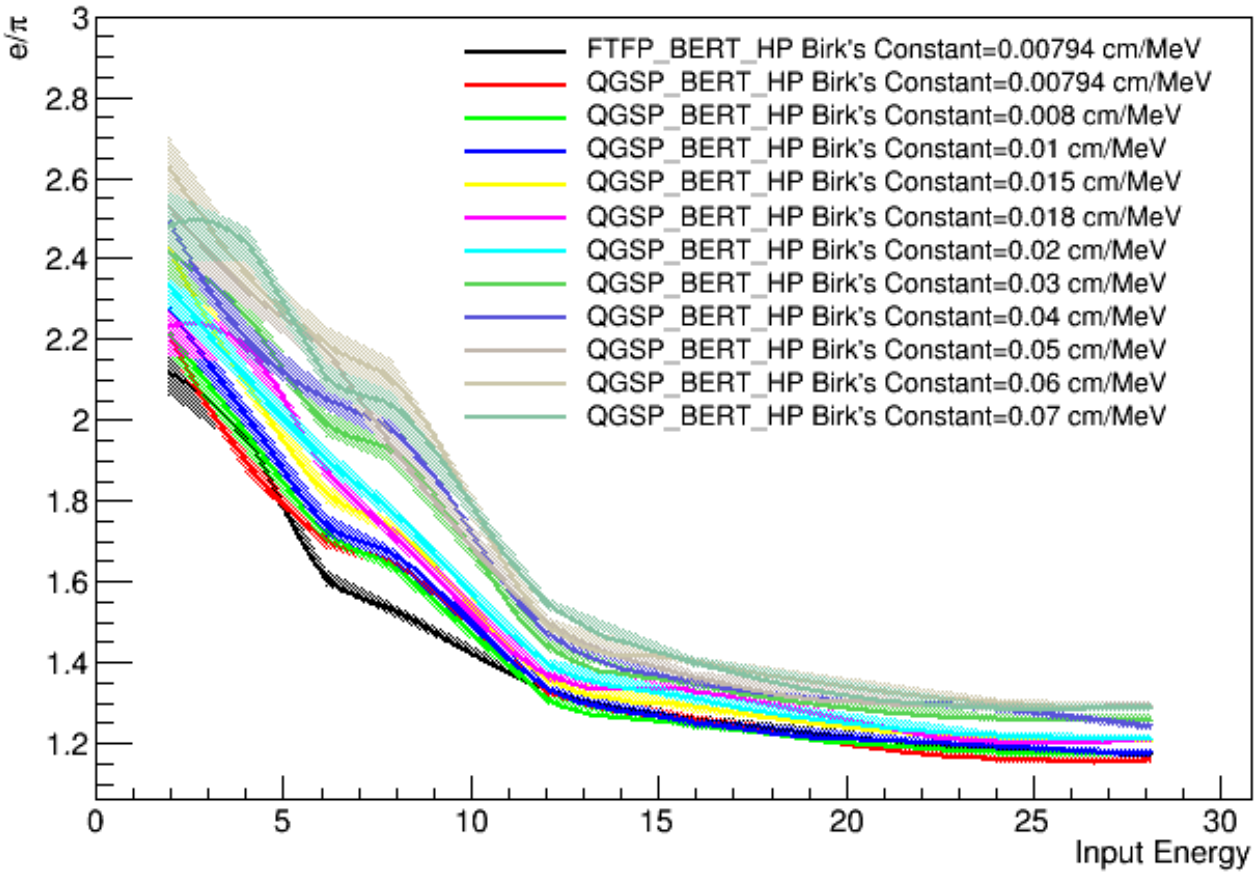
Birks's constant = 0.02 cm/MeV agrees with data well.

4 GeV hadron measurements are poor:

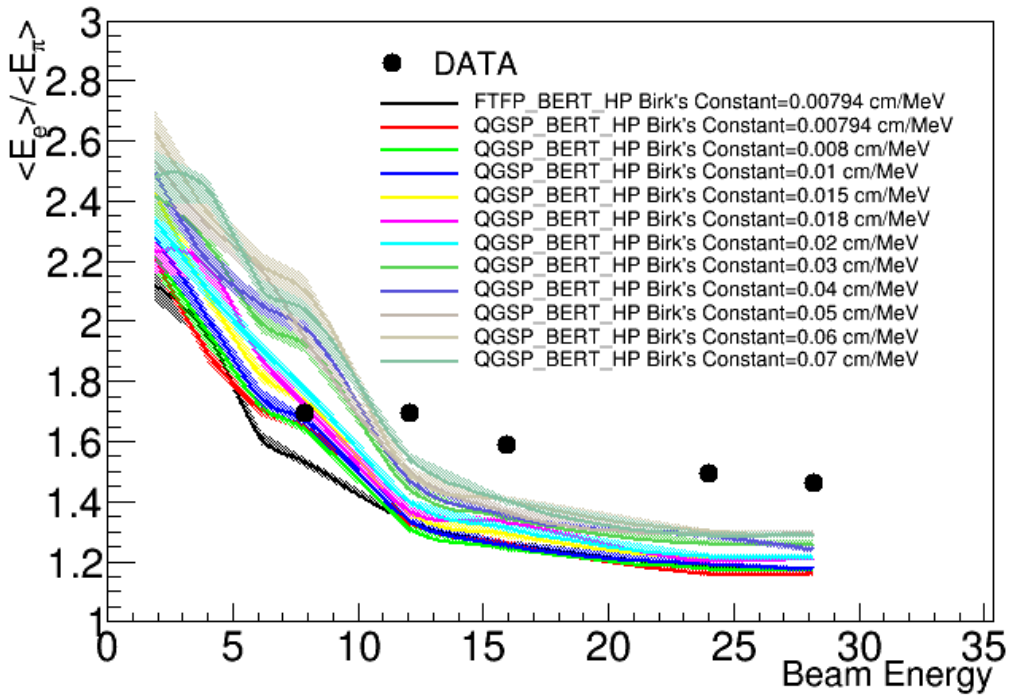
1. Low hadron fractions in lower energy.
2. Muon peak peak is also at 4 GeV



Full: EMCAL+HCAL e/pi



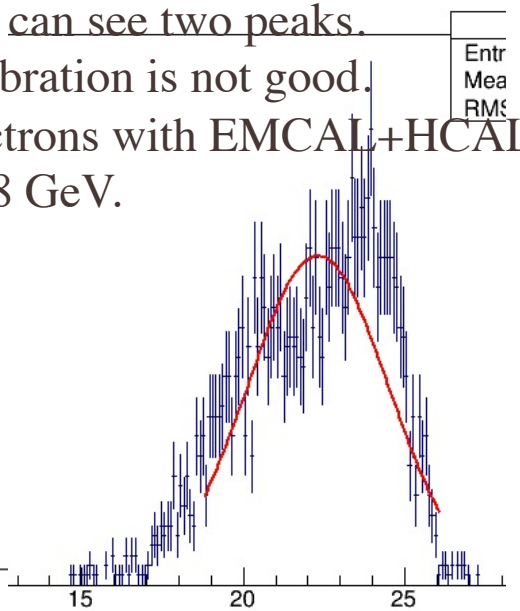
Comparison with data



The difference is still significant!!

e/pi was determined by taking ratios of electrons and pions measurements using exact same calibration constants.

You can see two peaks. Calibration is not good. Electrons with EMCAL+HCAL at 28 GeV.



I am fully convinced by the method of e/pi.

$$E_\pi = E_{EMCAL} + E_{HCAL}$$

$$E_e = (\frac{e}{\pi})_{EMCAL} E_{EMCAL} + (\frac{e}{\pi})_{HCAL} E_{HCAL}$$